New model systems for early land plant evolution (w16-05)
Vienna, Austria, 22 - 24 June 2016

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Early land plant systematics and palaeontology

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Invited Contribution

Microbial communities have existed on land since at least the Neoarchean (2800 to 2500 million years), but fossil evidence indicates that the ancestors of land plants first appeared much later during the mid-Ordovician some 470 million years ago. These latter communities probably comprised varied and mixed associations of Archaea, Bacteria, arthropods, lichens, fungi, green algae and extinct land plants called 'cryptophytes'. Little is known about the cryptophytes, but emerging evidence from fossil charcoal records minute sporophytes at the bryophyte level of complexity but with novel combinations of characteristics. Some are known to contain spores dispersed as tetrads and dyads suggesting that significant differences in sporogenesis operated in some early extinct lineages. The most intact and earliest well-preserved fossil ecosystem is the 407 million year old Rhynie Chert (Scotland). Here, plants were fossilised near to their sites of growth preserving soft tissues and organism associations. Such fossils provide unparalleled insights into the evolution of major organ systems in stem group vascular plants and lycophytes, including roots, shoots, leaves, vascular system and reproductive structures. They are helping us to understand how key plant organs evolved from precursor structures, to disentangle homology from homoplasy, to better reconstruct early life cycle evolution, and to learn about the co-evolution of plants and their fungal symbionts.

Oral presentation 22 June 2016